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THE BACTERIOLOGY OF THE URINE IN LOBAR PNEUMONIA *

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The urine during an attack of lobar pneumonia is decreased in amount and usually contains a trace of albumin and a few granular casts. This so-called febrile albuminuria, or toxemic nephritis, which is often associated with other acute infectious diseases, is characterized by certain transitory changes in the kidneys attributed to the action of toxins. Fraenkel and Reiche[1] in an accurate study of these changes found that the cortical layer was almost always exclusively affected, and only in rare instances were there casts in the collecting tubules. In the cortex the secreting parenchyma, the loop of Henle, and the straight tubules alone were involved, and the glomerular capsules contained variable amounts of exudate. The epithelium, except for occasional deposits of pigment, was not degenerated, and there were no recent changes in the medullary connective tissue. In 22 of the 26 cases studied, pneumococci were found in the kidneys, and these observers emphasize the importance of the bacteria in the production of this temporary nephritis. The elimination of the pneumococci through the urine during an attack of pneumonia has often been referred to in the literature, but there is little evidence of a convincing nature to support this view. Should it be proved, however, that pneumococci are commonly found in the urine of pneumonia patients, urine cultures would aid in the diagnosis and the control of the disease. It would be interesting, however, to know whether the pneumococci were in any way changed by their passage through the urinary system. To throw light on these questions bacteriologic examinations of the urine of patients suffering from lobar pneumonia have been made, and the results obtained are here recorded.

TECHNIC

Urine cultures were made according to the technic described by Dick and Henry.[2] The samples of urine were obtained by catheterization under strict

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[1] Ztschr. f. klin. Med., 1894, 24, p. 230.

[2] Jour. Infect. Dis., 1914, 15, p. 85.

aseptic precautions. A small amount of urine was centrifugated and the sediment examined for casts, leukocytes, bacteria, and other pathologic elements. Cultures were made in human-blood agar plates, the sediment from 10 c.c. of fresh urine being used in varying dilutions. These were incubated for 24 hours at 37 C. All bacteria found that resembled pneumococci or streptococci were studied culturally and biologically, and compared with organisms isolated from the blood or the sputum. Pneumococci could usually be identified by the use of specific sera. In every instance, however, all the usual differential cultural reactions were studied.

Blood and sputum cultures were made according to the technic described in a previous communication.[3]

A bacteriologic examination of the urine and of the sputum or blood was made in 26 cases of lobar pneumonia at various times during the course of the infection. The results are recorded in Table 1. In 10 instances, or 38.4%, pneumococci were isolated from the urine. A microscopic examination of the stained smears of the sediment used for cultures revealed the presence of gram-positive diplococci in 18 instances, but in 8 of these the cultures were negative for pneumococci. This discrepancy might be explained by assuming that the organisms in

TABLE 1

THE URINARY FINDINGS IN 26 CASES OF LOBAR PNEUMONIA

Number of Case	Day of Course	Albumin	Chlorid Retention	Casts	Leukocytes	Micrococci	Pneumococci in Cultures	Other Organisms in Cultures
161	14	—	—	+	—	+	—	Staphylococci
162	12	—	—	—	—	—	—	Staphylococci
163	11	—	—	—	+	—	—	—
164	11	—	—	+	—	—	—	Staphylococci
165	15	—	—	—	+	+	++	—
166	8	+	+	—	—	+	+	—
167	14	+	—	—	+	—	—	—
168	21	—	—	—	—	+	—	Staphylococci
169	4	+	+	+	—	—	—	—
170	10	+	—	+	—	+	+	Staphylococci
171	7	—	—	—	—	+	+	Staphylococci
172	4	—	+	—	—	+	+	—
173	9	—	+	+	—	+	+	—
174	8	+	—	+	—	+	+	—
175	10	—	—	—	+	+	—	—
176	5	—	—	—	—	+	+	Staphylococci
177	9	+	+	—	—	+	+	—
178	21	—	—	—	—	—	—	Streptococcus viridans
180	41	—	—	+	—	+	—	Gram-positive diphtheroid bacilli
181	21	—	—	—	+	+	—	Staphylococci
182	14	—	—	+	—	+	—	—
188	4	—	—	—	—	—	—	—
189	7	—	+	—	—	—	—	—
190	6	+	+	+	—	+	—	Hemolytic streptococcus
191	8	—	+	+	—	+	+	Staphylococci
322	3	+	+	+	—	+	—	Staphylococci

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[3] Mathers: Jour. Infect. Dis., 1915, 17, p. 514.

the smears were staphylococci, or dead pneumococci, for pneumococci do not grow to any appreciable extent in urine. Of the 10 strains of pneumococci isolated from the urine, 5 were found to belong to Group I, 3 to Group II, and 2 to Group IV. These organisms were similar to the strains isolated from the blood or sputum. The biologic and cultural reactions were always the same. Minor variations were noted in the morphology of the organisms isolated from the different sources. These differences, however, are not significant, for the same strain of pneumococcus may vary widely in morphology when observed under different environmental conditions. In 8 cases the cultures were negative. Streptococci were isolated from the urine in 2 instances; they were few in number, and their presence in the urine could be explained on the basis of foci of infection in the mouth, for both cases had numerous alveolar abscesses and marked pyorrhea alveolaris. Other organisms, such as staphylococci and diphtheroid bacilli, were found in several instances.

The urine was examined at various stages of the infection and pneumococci were isolated chiefly at a time just before or just after the crisis. At the onset of the disease or several days after the infection had subsided, the urine cultures were usually negative. The pneumococci were never present in large numbers. Furthermore, the number of pneumococci in the urine did not seem to bear any relation to the other pathologic elements in the sediment. Albumin and granular casts were found during the acute stage of the infection. Altho leukocytes were observed in the stained smears of the sediment, they were few in number, and like the other pathologic elements usually disappeared as quickly as the infection.

SUMMARY

During the course of an attack of lobar pneumonia, pneumococci may be excreted in the urine. They appear in the urine usually at a time just before or just after the crisis and do not seem to bear any definite relation to the other pathologic elements in the sediment. The pneumococcus strains isolated from the urine in these experiments are similar to those found in the blood and the sputum.

Pneumococci do not grow in urine to any appreciable extent, but the urine of pneumonia patients should be handled carefully, for it is a possible source of infection in hospitals.

Urinary cultures may be of great value in the diagnosis of pneumonia or of pneumococcal infections in general.